

WHAT IS CLAIMED IS:

- 1           1.       An apparatus for the treatment of body conduits, the apparatus  
2 comprising:  
3               an elongated body configured to be inserted into a body conduit, the  
4 elongated body having a proximal end and a distal end; and  
5               a source of energy for emitting energy from the elongated body in  
6 an intensity which, when applied to walls of the body conduit causes a change in  
7 smooth muscle tissue which prevents the smooth muscle tissue from replicating.
- 1           2.       The apparatus of Claim 1, wherein the source of energy is a source  
2 of light energy and the apparatus further comprises:  
3               a light transmitting fiber extending from the proximal end to the  
4 distal end of the elongated body for transmitting light into the body conduit;  
5               a connector on the distal end of the elongated body for connecting  
6 the elongated body to the source of light energy; and  
7               a light directing member positioned at a distal end of the elongated  
8 device for diffusing or redirecting the light from the light transmitting fiber in a  
9 substantially radial pattern from the distal end of the elongated device.
- 1           3.       The apparatus of Claim 2, wherein the source of light delivers light  
2 having a wavelength of about 240 nm to about 280 nm.
- 1           4.       The apparatus of Claim 2, wherein the source of light delivers light  
2 in the red visible range.
- 1           5.       The apparatus of Claim 1, wherein the source of energy delivers  
2 energy having a wavelength and intensity which, when applied to the walls of the  
3 body conduit crosslinks DNA in smooth muscle cells surrounding the conduit and  
4 prevents the smooth muscle cells from replicating.

1           6.       The apparatus of Claim 2, wherein the light directing member  
2 includes a substantially conical reflective surface which redirects light from the  
3 light transmitting fiber in a direction away from a longitudinal axis of the fiber.

1           7.       The apparatus of Claim 6, wherein the reflective surface is concave  
2 in cross section.

1           8.       The apparatus of Claim 6, wherein the reflective surface is  
2 substantially planar in cross section.

1           9.       The apparatus of Claim 6, wherein the reflective surface is  
2 substantially parabolic in cross section.

1           10.      The apparatus of Claim 2, wherein the light directing member  
2 includes a diffusing lens which directs light from the transmitting fiber in a  
3 direction away from a longitudinal axis of the fiber.

1           11.      The apparatus of Claim 2, wherein the light transmitting fiber is  
2 surrounded by a sheath for delivery to the airway.

1           12.      The apparatus of Claim 11, wherein the sheath includes a distal end  
2 section which is transparent to the energy emitted by the light source.

1           13.      The apparatus of Claim 11, wherein the sheath includes a distal  
2 section having a plurality of windows which are transparent to the energy emitted  
3 by the light source to allow the light which has been redirected by the light  
4 directing member to exit the sheath.

1           14.    The apparatus of Claim 1, wherein the source of energy is a  
2   radioactive pellet positioned at the distal end of the elongated body.

1           15.    The apparatus of Claim 1, wherein the source of energy is a  
2   radioactive pellet which is movable longitudinally within the elongated body to  
3   treat the body conduit.

1           16.    An apparatus for the treatment of walls of airways in a patient's  
2   lungs, the apparatus comprising:

3                   an elongated body configured to be inserted into the airways of a  
4   patient's lungs, the device having a proximal end and a distal end;

5                   a source of energy for emitting energy from the distal end of the  
6   elongated body in an intensity which, when applied to the walls of the airway  
7   causes a change in smooth muscle tissue which prevents the smooth muscle tissue  
8   from replicating.

1           17.    The apparatus of Claim 16, wherein the source of energy is a light  
2   source and the apparatus further comprises:

3                   a light transmitting fiber extending from the proximal end to the  
4   distal end of the elongated body for transmitting light from the light source into the  
5   patient's lungs;

6                   a connector on the distal end of the elongated body for connecting  
7   the elongated body to the source of light; and

8                   a light directing member positioned at a distal end of the elongated  
9   device for diffusing or redirecting the light from the light transmitting fiber in a  
10   substantially radial pattern from the distal end of the elongated device.

1           18.     The apparatus of Claim 16, wherein the source of energy delivers  
2     energy having a wavelength and intensity which, when applied to the walls of the  
3     airway crosslinks DNA in smooth muscle cells surrounding the airway and  
4     prevents the smooth muscle cells from replicating.

1           19.     The apparatus of Claim 16, wherein the source of energy delivers  
2     energy having a wavelength and intensity which, when applied to the walls of the  
3     airway crosslinks DNA in mucus gland cells surrounding the airway and prevents  
4     the mucus gland cells from replicating.

1           20.     An apparatus for the treatment of walls of an esophagus, the  
2     apparatus comprising:  
3                 an elongated body configured to be inserted into the esophagus, the  
4     elongate body having a proximal end and a distal end; and  
5                 a source of energy for emitting energy from the elongated body in  
6     an intensity which, when applied to the walls of the esophagus causes a change in  
7     smooth muscle tissue which prevents the smooth muscle tissue from replicating.

1           21.     The apparatus according to Claim 20, wherein the source of energy  
2     is a light source and further comprising:  
3                 a light transmitting fiber extending from the proximal end to the  
4     distal end of the elongated body for transmitting light into the esophagus;  
5                 a connector on the distal end of the elongated body for connecting  
6     the elongated body to the source of light; and  
7                 a light directing member positioned at a distal end of the elongated  
8     device for diffusing or redirecting the light from the light transmitting fiber in a  
9     substantially radial pattern from the distal end of the elongated device.

1           22.     The apparatus of Claim 21, wherein the light source delivers light  
2     having a wavelength of about 240 nm to about 280 nm, or delivers light in the red  
3     visible range.

1           23.     The apparatus of Claim 20, wherein the source of energy is a  
2     radioactive pellet positioned within the elongated body.

1           24.     An apparatus for treatment of walls of a ureter or urethra, the  
2     apparatus comprising:  
3                 an elongated body configured to be inserted into the ureter or  
4     urethra, the device having a proximal end and a distal end; and  
5                 a source of energy for emitting energy from the elongated body in  
6     an intensity which, when applied to the walls of the ureter or urethra causes a  
7     change in smooth muscle tissue which prevents the smooth muscle tissue from  
8     replicating.

1           25.     The apparatus of Claim 24, wherein the source of energy is a light  
2     source and further comprising:  
3                 a light transmitting fiber extending from the proximal end to the  
4     distal end of the elongated body for transmitting light into the ureter or urethra;  
5                 a connector on the distal end of the elongated body for connecting  
6     the elongated body to the source of light; and  
7                 a light directing member positioned at a distal end of the elongated  
8     device for diffusing or redirecting the light from the light transmitting fiber in a  
9     substantially radial pattern from the distal end of the elongated device.

1           26.     The apparatus of Claim 25, wherein the light source delivers light  
2     having a wavelength of about 240 nm to about 280 nm, or delivers light in the red  
3     visible range.

1           27.     The apparatus of Claim 24, wherein the source of energy is a  
2     radioactive pellet positioned within the elongated body.

1     ~~sub A2~~ 28.     A method of treating asthma to control bronchospasms, the method  
2     comprising:  
3                 irradiating the walls of an airway in a lung in a wavelength and  
4     intensity which causes a change in smooth muscle tissue cells and prevents the  
5     smooth muscle tissue cells from replicating; and  
6                 controlling bronchospasms by reduction or elimination of smooth  
7     muscle tissue.

1     ~~sub B2~~ 29.     The method of Claim 28, wherein the irradiation of the walls is  
2     performed by emitting a light energy having a wavelength of about 240 nm to  
3     about 280 nm.

1     ~~sub B3~~ 30.     The method of Claim 28, wherein the irradiation of the walls is  
2     performed by emitting light energy having a wavelength in the red visible range.

1           31.     The method of Claim 28, wherein the irradiation of the walls is  
2     performed by exposing the walls to radiation emitted by a radioactive pellet.

1           32.     The method of Claim 28, wherein the irradiation of the walls is  
2     performed by moving an energy delivery device along the airway.

1     ~~sub A3~~ 33.     A method of treating respiratory conditions to control mucus  
2     plugging, the method comprising:

3 irradiating the walls of an airway in a lung in a wavelength and  
4 intensity which causes a change in mucus gland cells and prevents the mucus gland  
5 cells from replicating; and  
6 preventing mucus plugging by reduction or elimination of mucus  
7 glands.

1 *Sub B5* 34. The method of Claim 33, wherein the irradiation of the walls is  
2 performed by emitting a light energy having a wavelength of about 240 nm to  
3 about 280 nm.

1 35. The method of Claim 33, wherein the irradiation of the walls is  
2 performed by emitting light energy having a wavelength in the red visible range.

1 36. The method of Claim 33, wherein the irradiation of the walls is  
2 performed by exposing the walls to radiation emitted by a radioactive pellet.

1 37. The method of Claim 33, wherein the irradiation of the walls is  
2 performed by moving an energy delivery device along the airway.

1 *Sub A1* 38. A method of treating an esophagus to reduce achalasia or  
2 esophageal spasm, the method comprising:  
3 irradiating the walls of an esophagus in a wavelength and intensity  
4 which causes a change in smooth muscle cells and prevents the smooth muscle  
5 cells from replicating; and  
6 preventing spasms of the smooth muscle tissue by elimination or  
7 reduction of the smooth muscle tissue.

1 sub 37 39. The method of Claim 38, wherein the irradiation of the walls is  
2 performed by emitting a light energy having a wavelength of about 240 nm to  
3 about 280 nm.

1 40. The method of Claim 38, wherein the irradiation of the walls is  
2 performed by emitting light energy having a wavelength in the red visible range.

1 41. The method of Claim 38, wherein the irradiation of the walls is  
2 performed by exposing the walls to radiation emitted by a radioactive pellet.

1 42. The method of Claim 38, wherein the irradiation of the walls is  
2 performed by moving an energy delivery device along the esophagus.

1 sub 45 43. A method of treating an ureter or an urethra to control spasms, the  
2 method comprising:  
3 irradiating the walls of an ureter or an urethra in a wavelength and  
4 intensity which causes a change in smooth muscle cells and prevents the smooth  
5 muscle cells from replicating; and  
6 preventing spasms of smooth muscle tissue by elimination or  
7 reduction of the smooth muscle tissue.

1 sub 48 44. The method of Claim 43, wherein the irradiation of the walls is  
2 performed by emitting a light energy having a wavelength of about 240 nm to  
3 about 280 nm.

1 45. The method of Claim 43, wherein the irradiation of the walls is  
2 performed by emitting light energy having a wavelength in the red visible range.



1           46.     The method of Claim 43, wherein the irradiation of the walls is  
2 performed by exposing the walls to radiation emitted by a radioactive pellet.

1           47.     The method of Claim 43, wherein the irradiation of the walls is  
2 performed by moving an energy delivery device along the ureter or urethra.

1           48.     A method of training a person to treat a body conduit by irradiation  
2 comprising demonstrating or instructing the steps of:

3                   irradiating walls of a body conduit with energy in wavelength and  
4 intensity which causes a change in smooth muscle tissue cells and prevents the  
5 smooth muscle tissue cells from replicating; and

6                   controlling spasms of smooth muscle tissue by elimination or  
7 reduction in the smooth muscle tissue surrounding the body conduit.

1           49.     The method of Claim 48, wherein the body conduit is selected from  
2 a group consisting of an airway in a lung, an esophagus, a ureter, and a urethra.

Add A1